

**Acadiana Bays  
Reef Restoration  
Feasibility Study  
LDNR**

# Purpose Of Project

- **Evaluate the effects of the introduction of reef structures within the Acadiana Bays System.**
- **These effects include:**
  - Salinity
  - Turbidity
  - Wave Climate
  - Storm Surge

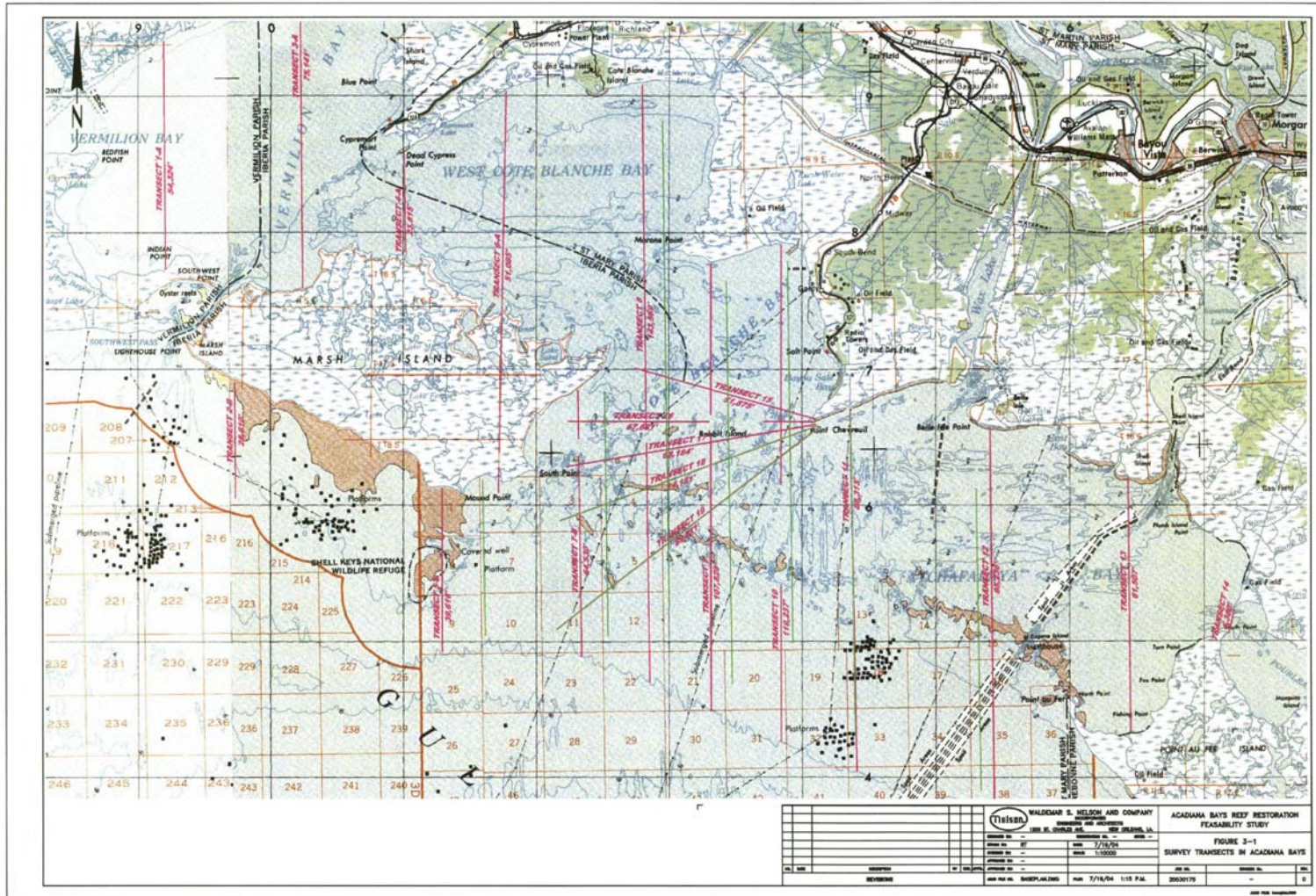
# **Principle Components Of Project**

- **Surveying Program**
- **Preliminary Engineering Program**
- **Hydrodynamic/Water Quality Modeling Program**
- **Habitat Suitability Assessment**

# Principle Components Of Project

- **Surveying Program**
  - From Four League Bay through Vermillion Bay
  - 19 transects run to develop current bathymetry

# Survey Transects



# Principle Components Of Project

- **Engineering Program**
  - Geotechnical Evaluation
  - Preliminary Design Of Reef
  - Reef Location And Alignment
  - Cost Estimates Of Reef Construction

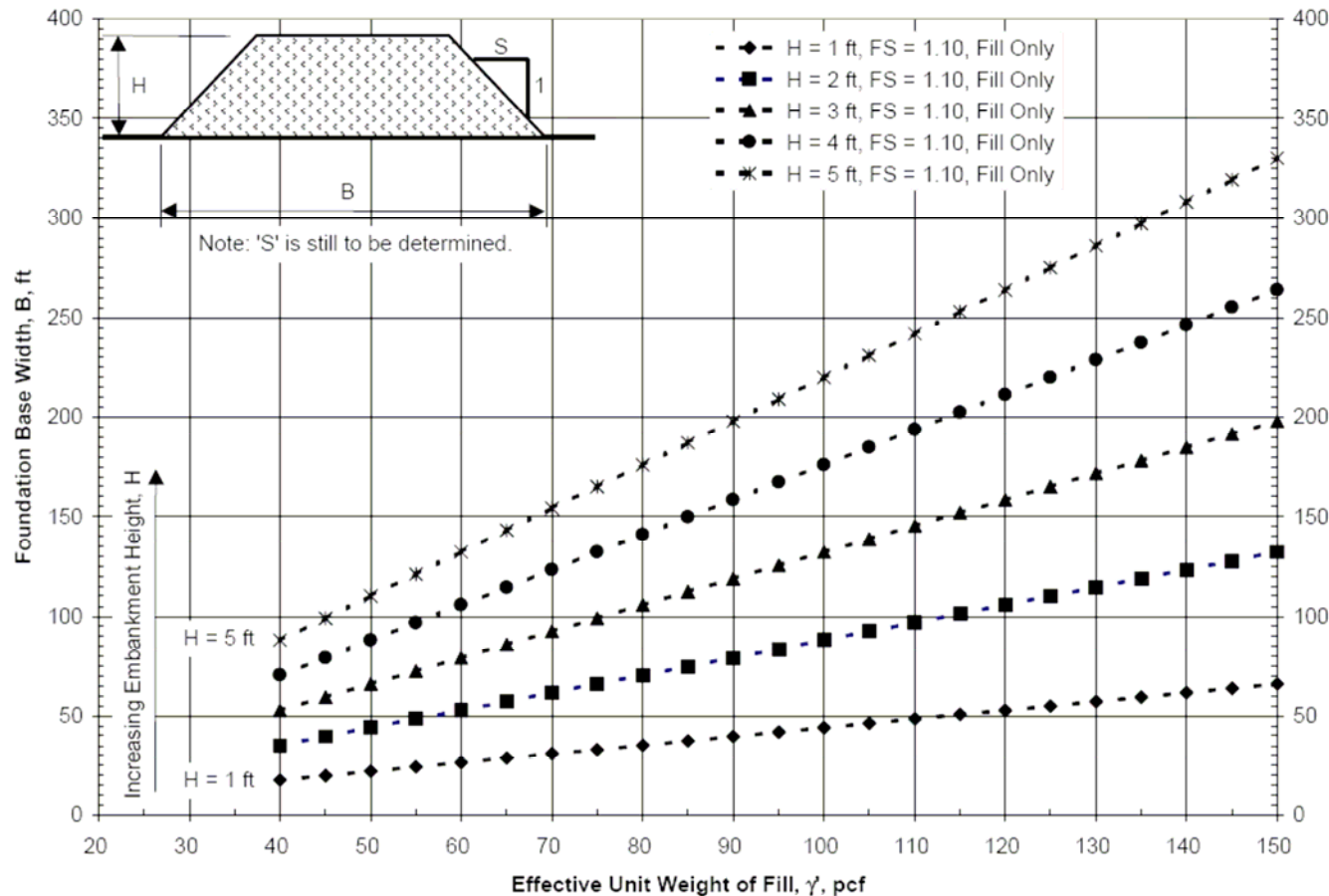
# Geotechnical Evaluation

LOURIE CONSULTANTS

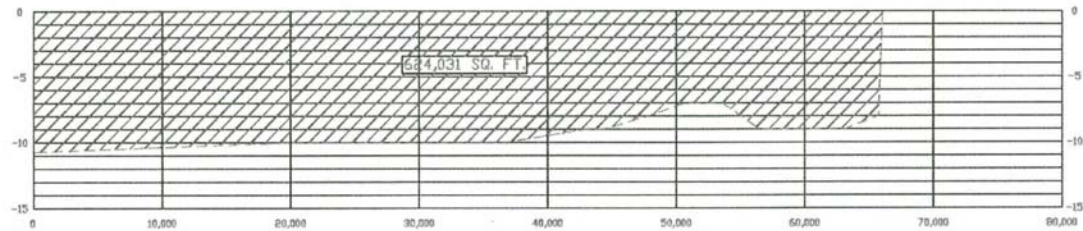
Project No. 0102-0011

## Acadiana Bays Project -- Coastal Louisiana

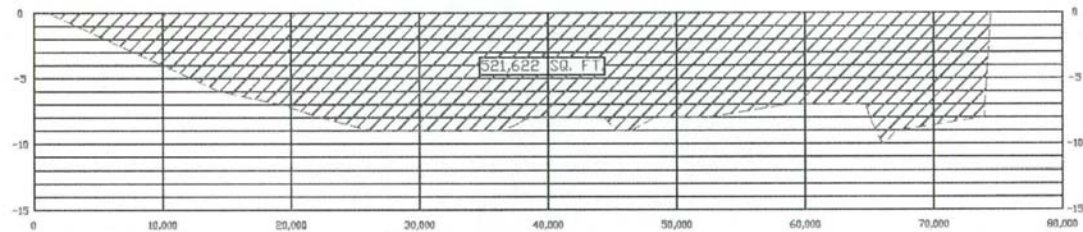
Foundation Base Width vs Fill Unit Weight For Embankment Height (H) Ranging From 1 to 5 ft  
Foundation: Very Soft to Soft Clay,  $S_u = 0$  psf at Mudline, Increasing Linearly to 400 psf at 40 ft



# Reef Section



REEF A

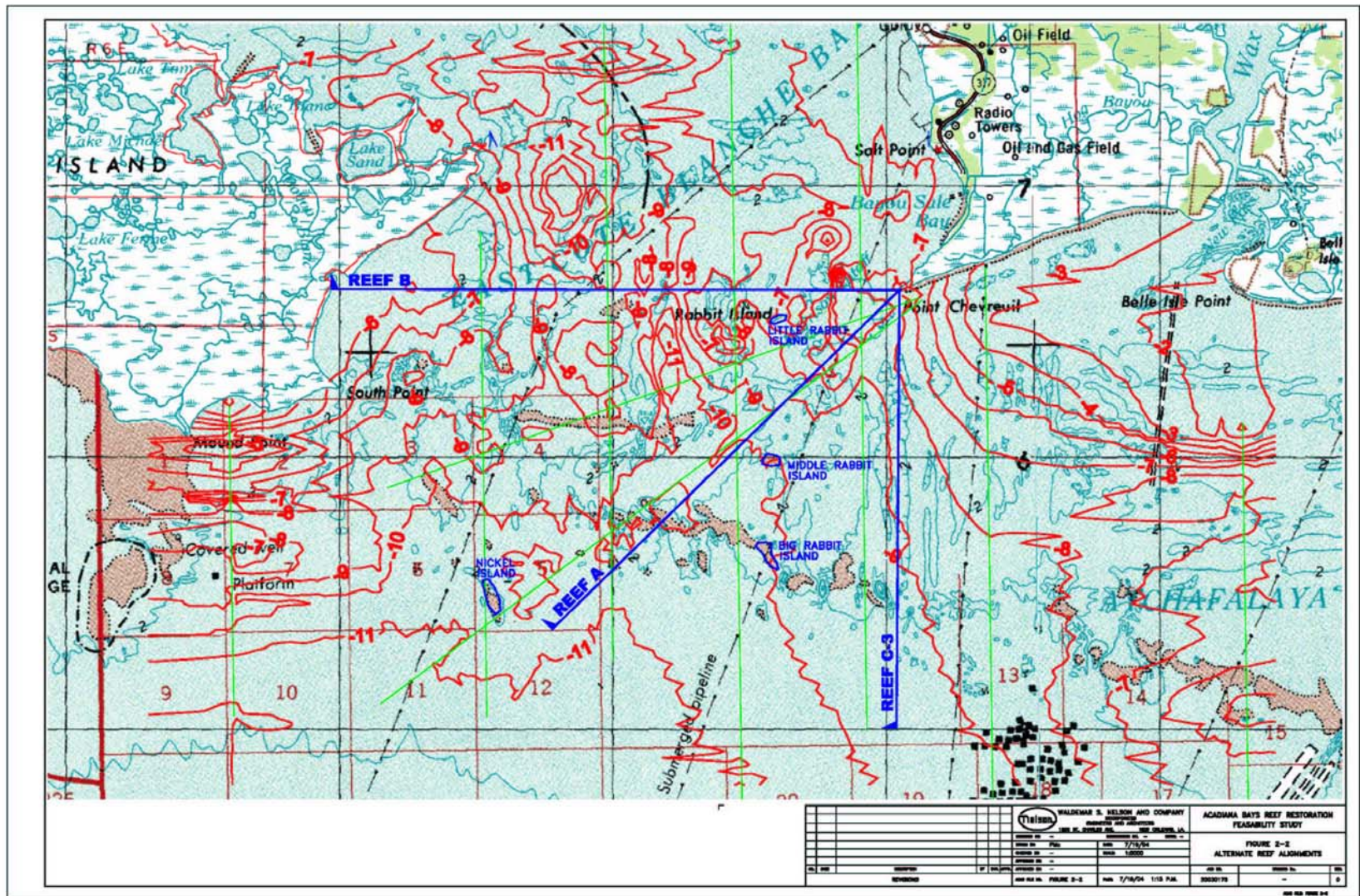


REEF B

NOTES:  
1. VERTICAL EXAGGERATION - 100X  
2. DRY IN 1992

<b>WALDMAN S. NELSON AND COMPANY</b> ENGINEERS AND ARCHITECTS 100 N. SHORE BL. HOUSTON, TX 77058		<b>ACADIANA BAYS REEF RESTORATION</b> FEASIBILITY STUDY	
DRAWN BY: CHECKED BY: DATE: 12/15/04 SCALE: 1:2000	PROJECT NO.: SHEET NO.: TOTAL SHEETS: 10	<b>FIGURE 6-3</b> <b>BATHYMETRIC SECTIONS OF</b> <b>ALTERNATE REEF ALIGNMENTS</b>	
DATE: 12/15/04 BY: J. JOHNSON, JR. FOR: LDNR	SHEET NO.: 30000175 TOTAL SHEETS: 10	DATE: 12/15/04 BY: J. JOHNSON, JR. FOR: LDNR	

# Alternate Reef Alignments



# Reef Construction Cost Estimates

TABLE 6-7  
ACADIANA BAYS PROJECT  
VOLUME SUMMARY

## REEF A

ELEVATION	FILL WEIGHT* (PCF)	VOLUME (CY)	COST
TOP OF REEF STRUCTURE AT EL. 0.00	70	4,740,000	\$155,500,000.00
	86	5,140,000	\$392,000,000.00
	86 (DSM)	830,000	\$295,000,000.00
TOP OF REEF STRUCTURE AT EL. -3.00	70	2,280,000	\$75,300,000.00
	86	2,520,000	\$192,000,000.00

## REEF B

ELEVATION	FILL WEIGHT* (PCF)	VOLUME (CY)	COST
TOP OF REEF STRUCTURE AT EL. 0.00	70	3,250,000	\$107,000,000.00
	86	3,680,000	\$281,000,000.00
	86 (DSM)	610,000	\$263,000,000.00
TOP OF REEF STRUCTURE AT EL. -3.00	70	1,400,000	\$47,000,000.00
	86	1,540,000	\$118,000,000.00

\* SUBMERGED FILL WEIGHT

# **Principle Components Of Project**

- **Oceanographic Monitoring Phase**
- **Modeling Program**
  - Currents
  - Salinity Regime
  - Turbidity
  - Dampening Of Storm Surges

# Monitoring Phase



CSI-14 Gage Installed for data acquisition.

[http://www.ndbc.noaa.gov/station\\_page.php?station=slpl1](http://www.ndbc.noaa.gov/station_page.php?station=slpl1)

# Acadiana Bays Modeling Program

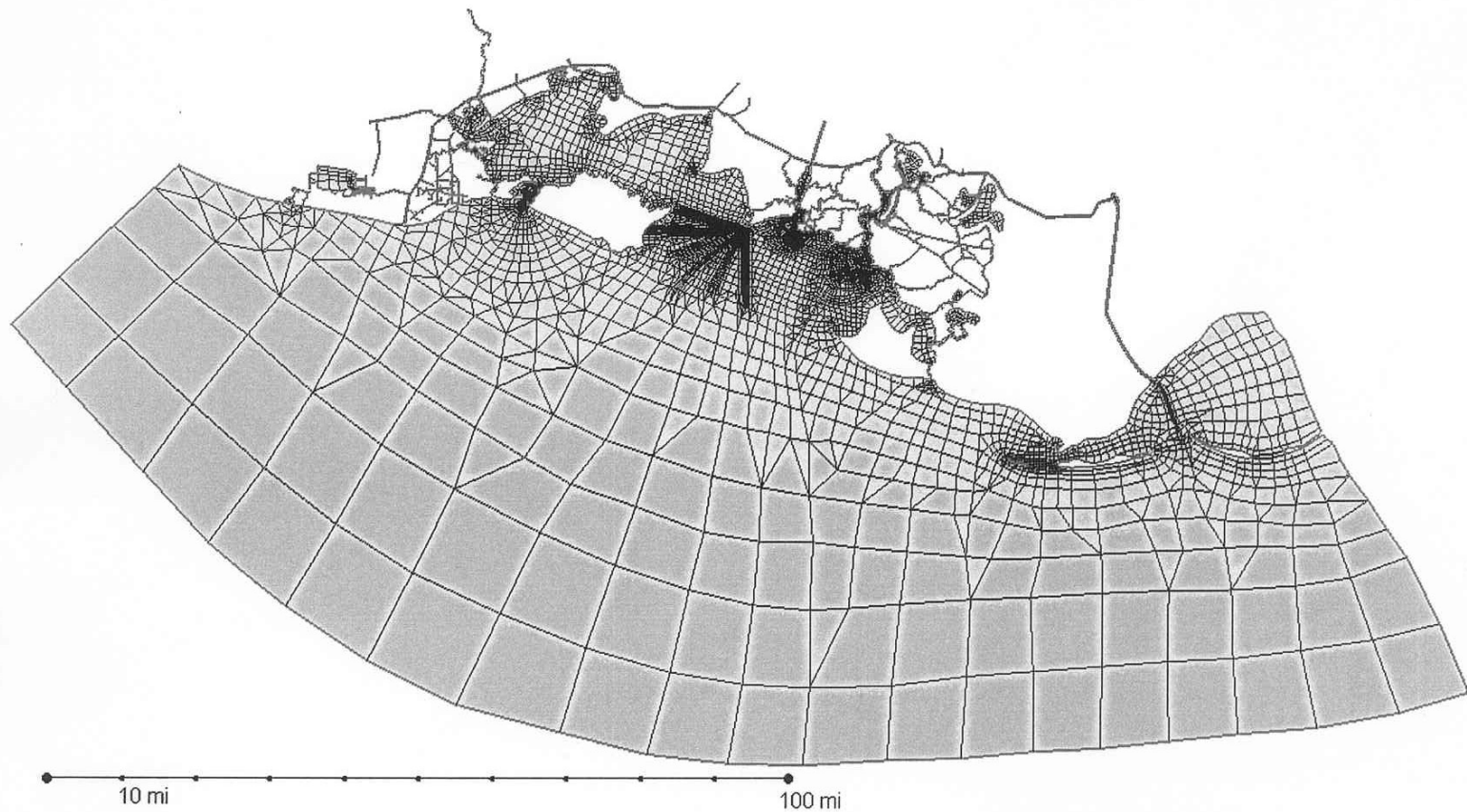


Figure 3.3 Model Mesh

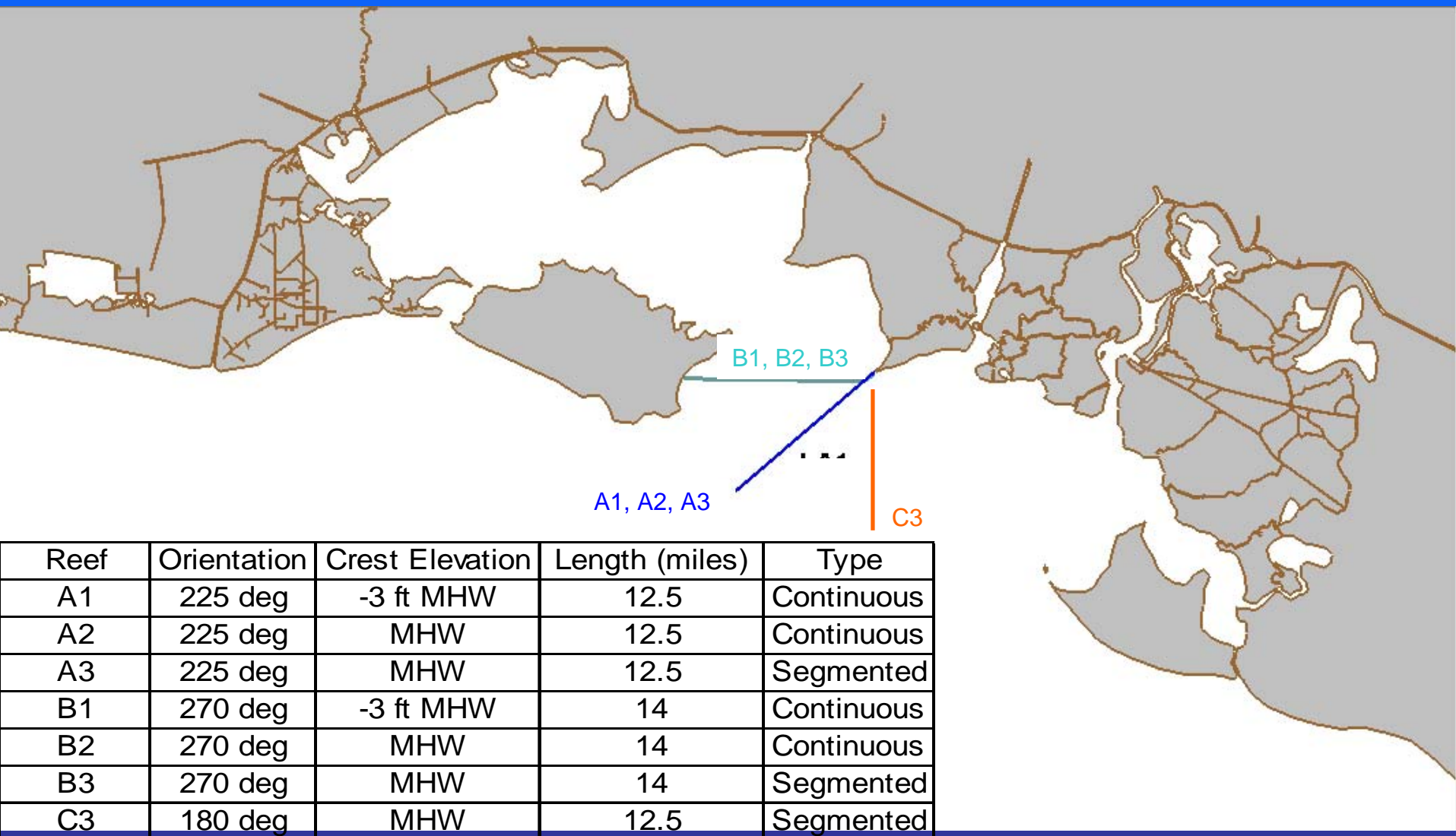
# Modeling Objectives

- Document the ability of reestablished reefs to influence turbidity and salinity regimes in Acadiana Bays.
- Document the influence of historic flow patterns on the salinity regime.
- Document the effect of reduced Atchafalaya River flow on present salinity regime.

# **Modeling Methodology**

- **Reef Reestablishment Effect**
  - Establish baseline conditions
    - Circulation, salinity, turbidity, and waves
  - Evaluate effects of reef alternatives on parameters
- **Historical Flows Effect**
  - Model pre-1940s bay-river configuration
- **Effects of Reduced Atchafalaya Flow**
  - 10% reduction in flow (diversion north of project area assumed)

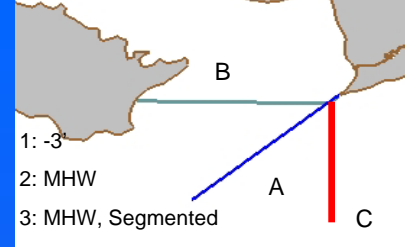
# Modeled Reef Alternatives



# **Modeling Methodology**

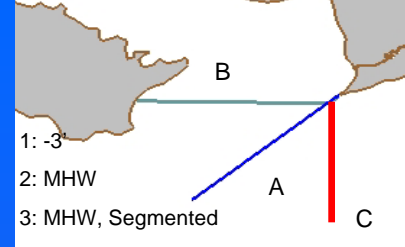
- **Data evaluation and acquisition**
- **Calibrate models**
- **Model representative seasonal conditions to examine annual variations**
  - High flow
  - Mean flow
  - Low/summer flow
  - Winter flow
- **Model low frequency storm conditions on waves**
- **Model pre-1940s bay-river configuration**
- **Compare with-reef to existing conditions**

# Overall Findings - Salinity



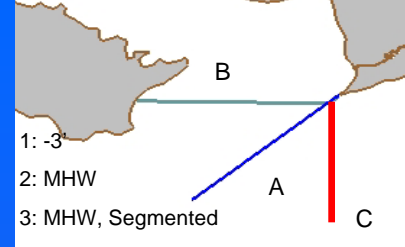
- **Reefs effects on salinity**
  - Submerged reefs had negligible effects
  - **Emergent continuous reefs**
    - A2 raised average salinities by 1 to 2 ppt in western bays
    - B2 raised average salinities by about 1 ppt in western bays
  - **Emergent segmented reefs**
    - A3 raised salinities but less than A2 in western bays
    - B3 raised salinities but less than B2 in western bays
    - C3 raised salinities slightly more than A3 in western bays

# Overall Findings - Turbidity



- Reefs effects on turbidity
  - Submerged reefs had negligible effects
  - Emergent continuous reefs decreased turbidities in western bays
    - 15-20% on average
    - 30% at best

# Overall Findings – Storm Surge

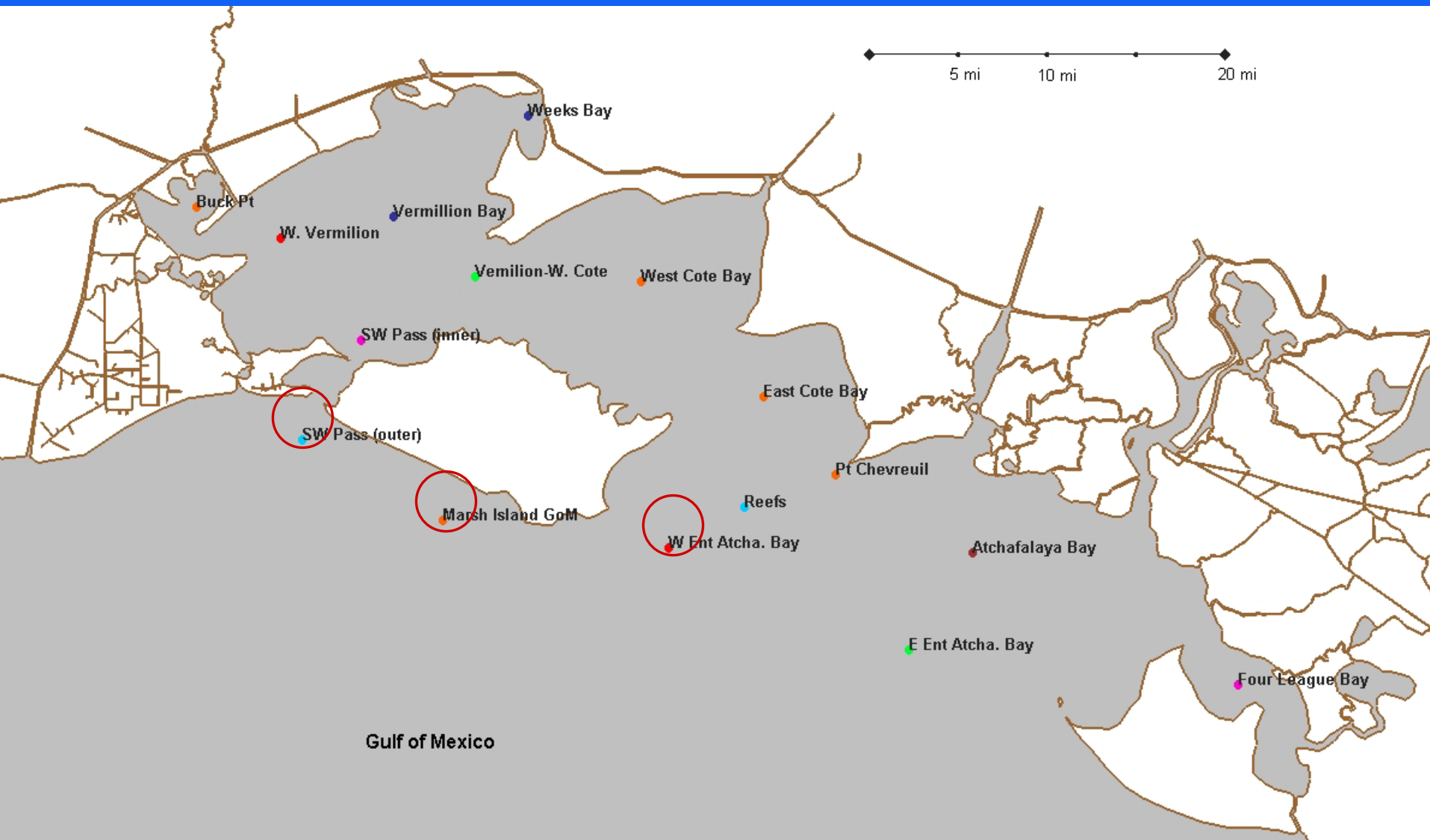


- **Reefs effects on storm surge**
  - Decrease storm surge along the bay shores
    - B2 produces the largest reduction – 0.5 ft (5%)
- **Reefs effects on waves**
  - Only affect their immediate vicinity because most of the waves are locally generated
  - Mud bottom dissipated most of Gulf-related swell
- **Modeling of pre-1940s configuration indicated higher salinities in the western bays.**

# Principle Components Of Project

- **Habitat Suitability Assessment**
- **Species examined**
  - Spotted Seatrout (speckled trout)
  - Brown Shrimp
  - White Shrimp

# Stations with Increases in Habitat Suitability for Speckled Trout (A2)



# Increase in HSI for Speckled Trout (Alt A2)

<u>Station</u>	<u>Increase in HSI</u>		<u>Station</u>	<u>Increase in HSI</u>
			West Cote Bay	0.00
SW Pass (outer)	<u>0.22</u>		East Cote Bay	0.00
SW Pass (inner)	0.00		Reefs	0.00
Vermillion Bay	0.00		Atchafalaya Bay	0.00
L Vermilion	0.00		W Ent Atcha. Bay	<u>0.11</u>
W. Vermilion	0.00		E Ent Atcha. Bay	0.00
Weeks Bay	0.00		Four League Bay	0.00
Vermilion-W. Cote	0.00		Marsh Island GoM	<u>0.13</u>

# Increase in HSI for Speckled Trout (Historic)

<u>Station</u>	<u>Increase in HSI</u>		<u>Station</u>	<u>Increase in HSI</u>
			West Cote Bay	0.79
SW Pass (outer)	1.00		East Cote Bay	0.75
SW Pass (inner)	1.00		Reefs	NP
Vermillion Bay	0.82		Atchafalaya Bay	0.04
L Vermilion	0.11		W Ent Atcha. Bay	1.00
W. Vermilion	0.75		E Ent Atcha. Bay	0.68
Weeks Bay	0.75		Four League Bay	NP
Vermilion-W. Cote	0.79		Marsh Island GoM	0.61

# Summary of Habitat Suitability Assessment

- Habitat suitability for speckled trout is likely limited by salinity in the Bays system.
- Alternative A2 (maximum salinity change) increases suitability  $<0.25$  in only three offshore stations.
- “Historic Conditions” run increases suitability in all stations to where salinity would no longer be limiting (food and cover would limit).
- Reef restoration alone would not significantly increase speckled trout abundances.
- Shrimp are probably more limited by the lack of submerged vegetation than by salinity.

# Summary Of Feasibility Study Findings

- Reef alignments evaluated do not significantly affect salinity levels in western bays.
- Reefs do reduce turbidity levels in western bays.
- Reefs do not cause significant dampening of storm surges at coastline.
- Predicted salinity changes would not significantly improve habitat suitability for marine species evaluated.

# Summary Of Feasibility Study Findings

- Project could be costly.
- Examination of historic conditions suggests that the construction of the Wax Lake Outlet and the GIWW probably influenced salinity patterns much more than the removal of the historic reefs.